Claims:

1. A process for manufacturing rare earth metal oxide thin films on a substrate by an ALD type process in an ALD reactor having a reaction space, wherein a repeated pulsing cycle comprises the steps of

- feeding a vapor phase pulse of a rare earth metal source chemical with the help of an inert carrier gas into the reaction space of the ALD reactor, said metal source chemical being a cyclopentadienyl compound of the rare earth metal;
- contacting the vapor phase pulse of the rare earth metal source chemical with the surface of the substrate to bind the rare earth metal source chemical to the surface;
- purging the reaction space with an inert gas to remove any unreacted rare earth metal source chemical from the reactor;
- feeding a vapor-phase pulse of a reactive oxygen source chemical with the help of an inert carrier gas into the reaction space;
- reacting the oxygen source chemical with the rare earth metal source chemical bonded to the surface to form a rare earth metal oxide on the surface; and
- purging the reaction space with an inert gas to remove any unreacted oxygen source chemical from the reactor.

2. The process according to claim 1, characterized in that the reactive source of oxygen is water or a mixture of oxygen and ozone.

3. The process according to claim 1, characterized in that the reactive source of oxygen is hydrogen peroxide or a mixture of water and hydrogen peroxide.

4. The process according to claim 1, characterized in that the reactive source of oxygen is oxygen plasma.

5. A process for manufacturing yttrium oxide (Y_2O_3) or lanthanum oxide (La_2O_3) thin films by an ALD type process where

- a vapor phase pulse of a metal source chemical is fed with the help of an inert carrier gas into the reaction space of an ALD reactor;
- the reaction space is purged with an inert gas;

- a vapor-phase pulse of an oxygen source chemical is fed with the help of an inert carrier gas into the reaction space; and
- the reaction space is purged with an inert gas,

c h a r a c t e r i z e d in that the metal source chemical is tris(cyclopentadienyl)yttrium (Cp_3Y), tris(methylcyclopentadienyl)yttrium ($(CpMe)_3Y$) or tris(methylcyclopentadienyl)lanthanum ($(CpMe)_3La$) and the oxygen source chemical is water or a mixture of oxygen and ozone.

6. A process according to claim 3, c h a r a c t e r i z e d in that the deposition temperature is from 175 to 450 °C, preferably from 200 to 400 °C and the deposition pressure is between 1 and 50 mbar when depositing Y_2O_3 from $(CpMe)_3Y$.

7. A process according to claim 3, c h a r a c t e r i z e d in that the deposition temperature is from 175 to 450 °C, preferably from 200 to 400 °C and the deposition pressure is between 1 and 2 mbar when depositing Y_2O_3 from $(CpMe)_3Y$.

8. A process according to claim 5, c h a r a c t e r i z e d in that the deposition temperature is from 175 to 400 °C, preferably from 250 to 300 °C and the deposition pressure is between 1 and 50 mbar when depositing Y_2O_3 from Cp_3Y.

9. A process according to claim 5, c h a r a c t e r i z e d in that the deposition temperature is from 175 to 400 °C, preferably from 250 to 300 °C and the deposition pressure is between 1 and 2 mbar when depositing Y_2O_3 from Cp_3Y.

10. A process according to claim 5, c h a r a c t e r i z e d in that the deposition temperature is from 160 to 165 °C and the deposition pressure is between 1 and 50 mbar when depositing La_2O_3 from $(CpMe)_3La$.

11. A process according to claim 5, c h a r a c t e r i z e d in that the deposition temperature is from 160 to 165 °C and the deposition pressure is between 1 and 2 mbar when depositing La_2O_3 from $(CpMe)_3La$.

12. A process according to claim 1 or claim 5, c h a r a c t e r i z e d in that the substrate is a silicon wafer or soda lime glass.

13. A process according to claim 1 or claim 5, c h a r a c t e r i z e d in that the substrate is a compound semiconductor.

14. A process according to claim 13, wherein the substrate is GaAs.